UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program : Seventh Semester – Fall 2021 Roll No. .....

Paper: Operations Research-I **Course Code: MATH-412** **Time: 3 Hrs. Marks: 60**

Q.1. Solve the following: **(6x5=30)**

1 A farm uses at least 800 lb of special feed daily. The special feed is a mixture of corn and soya bean meal with the following compositions.

lb per lb of feed stuff

Feed stuff	Protein	Fiber	Cost ($/lb)
Corn	0.09	0.02	0.30
Soya bean meal	0.60	0.06	0.90

The diet requirement is at least 30% protein and at most 5% fiber. The farm wishes to calculate the daily minimum cost of feed mix.
Formulate the LP model for the problem.

2 Use graphical method to find the optimal solution of the following LP model.
Maximize $z = 3x_1 + 2x_2$
subject to

$$5x_1 + x_2 \leq 10$$
$$2x_1 + 2x_2 \leq 12$$
$$x_1 + 4x_2 \leq 12$$
$$x_1, x_2 \geq 0$$

3 Write the steps of Vogel approximation method.

4 Apply dual simplex method and find the first two iterations for the following problem.
Minimize $z = 2x_1 + 3x_2$
subject to

$$2x_1 + 2x_2 \leq 3$$
$$x_1 + 2x_2 \geq 1$$
$$x_1, x_2 \geq 0$$

5 Write a note on the case of degeneracy in the use of the simplex method.

6 Solve the following assignment model using Hungarian method.

	1	2	3	4
1	$1	$4	$6	$3
2	$9	$7	$10	$9
3	$4	$5	$11	$7
4	$8	$7	$8	$5

Solve the following: **(3x10=30)**

Q.2 Show that the M-method will conclude that the following problem has no feasible solution.
Maximize $z = 2x_1 + 5x_2$
subject to

$$3x_1 + 2x_2 \geq 6$$
$$2x_1 + x_2 \leq 2$$
$$x_1, x_2 \geq 0$$

Q.3 Solve the following problem using simplex method and find alternative optimal basic solutions.
Maximize $z = 2x_1 - x_2 + 3x_3$
subject to

$$x_1 - x_2 + 5x_3 \leq 5$$
$$2x_1 - x_2 + 3x_3 \leq 20$$
$$x_1, x_2, x_3 \geq 0$$

Q.4 Apply uv-multiplier method taking $u_1 = 0$ to find the optimal solution for the following transportation model. Use the least cost method to find the starting solution.

$10	$4	$2	8
$2	$3	$4	5
$1	$2	$0	6
7	6	6	